DEPARTMENT OF THE INTERIOR UNITED STATES GEOLOGICAL SURVEY FORMATION DESCRIPTION AND BED Alluvium and terrace Alluvium includes sand and gravel of stream bottoms, generally thin and discontinuous, and thick older valley fill of alluvium and slope wash that is being extensively gullied. Terrace deposits of Purgatoire River, consist of thick layers of cobble and pebble gravel and sand; pebbles and cobbles largely derived from crystalline rocks in headwaters areas. Sandstone and shale. Sandstone in thick beds. grayish-orange-pink, medium - to coarse-grained, pebbly in basal part and conglomeratic locally in middle part; arkosic; forms prominent cliffs and ledges. Shale, grayish-orange or brownish gray, poorly laminated. Locally basal bed is thin bed of dark-brownish-red, arkosic, pebbly, silicified sandstone; elsewhere contact is within lithology that grades without break into 10-ft thick beds of shale alternating with 2 - 3-ft thick beds of sandstone of upper part of the Raton Formation. / Colluvium and soil produced from Poison Canyon Formation is generally light reddish brown, sandy, drains well, and forms stable subgrade for roads. General description of Raton Formation: Sandstone, shale, coaly shale and mudstone, and coal. Sandstone, pale-gray to pale yellowish-gray in lower part, pale yellowish-orange to pale reddish-gray in upper part, fine- to medium-grained, quartzose; grains subangular; generally in thick commonly abruptly lenticular channel-filling beds; commonly crossbedded; poorly to moderately well cemented. Shale, yellowishbrown in upper part, medium to dark brownish-gray in lower part; generally sandy or silty; locally contains abundant fronstone nodules and concretions. Coaly and carbonaceous shale generally contain beds of coal a few inches thick. Most coal beds are lenticular, contain thin, generally discontinuous partings of shale or siltstone; some beds contain one or more thin persistent partings of tonstein -- volcanic ash altered to kaolinite. Sandstone roof of coal beds common; coal generally rests on floor of coaly shale or gray shale; underclay rare or absent. Intervals between coal zones become thinner northeastward. Lower, principal coal bed of Boncarbo coal zone reportedly splits northeast of Boncarbo; elsewhere shale parting in middle of bed 3- to 10- in thick is apparently persistent. Mollusks include freshwater gastropeds closely spaced as to form a distinct bed two inches thick in shale bed that contains scattered thick shelled bivalve mollusks. Pollen from the enclosing shale was identified by Robert H. Tschudy (U.S. Geological Survey, written Commun., 1977) and include the following palynomorphs: Abietineaepollenites; Maceopolipollenites tenuipolus; Triatripollenites granulatus; Ulmipollenites 3 pored, 4 pored; Chenopodipollis; Polypodiumsporites; Arecipites; Fraxinoipollenites; Tricolpites hians. According to Tschudy they indicate an early but not earliest Paleocene age; deposition was probably on a flood plain, probably not near highlands because conifers are very slightly represented. Primero coal bed locally contains partings in lower part. Channelling into coal bed commonly abrupt and complete. Peacock coal bed named after Peacock coal mine 21/2 miles ESE of NE corner of quadrangle. Outcrops of Peacock coal are identified on basis of stratigraphic position and may represent any bed of coal zone. Maximum thickness observed in core hole: C.F.&I. Colorado Canyon No. 3 in NELSW sec. 24, T. 32 S., R. 65 W. Frederick coal bed named for Frederick mine 4 miles west of SW corner of quadrangle; contains parting of tonstein. Martinez coal bed commonly overlain by 10-15 ft of brownish gray shale containing ironstone nodules; locally overlain by thick bed Frederick leader coal bed, generally 5 to 10 below Frederick coal bed contains tonstein bed at base. Cass coal zone correlated with Cass and Bear Canyon coal beds of the Aguilar coal Cass district (Harbour and Dixon, 1959). Lower bed coal zone

Dominantly dark gray sandy and silty shale, with

The top of the Vermejo Formation was mapped at base of first principal sandstone bed above the Sopris

or Cokedale coal bed. In other areas a pebbly sand-

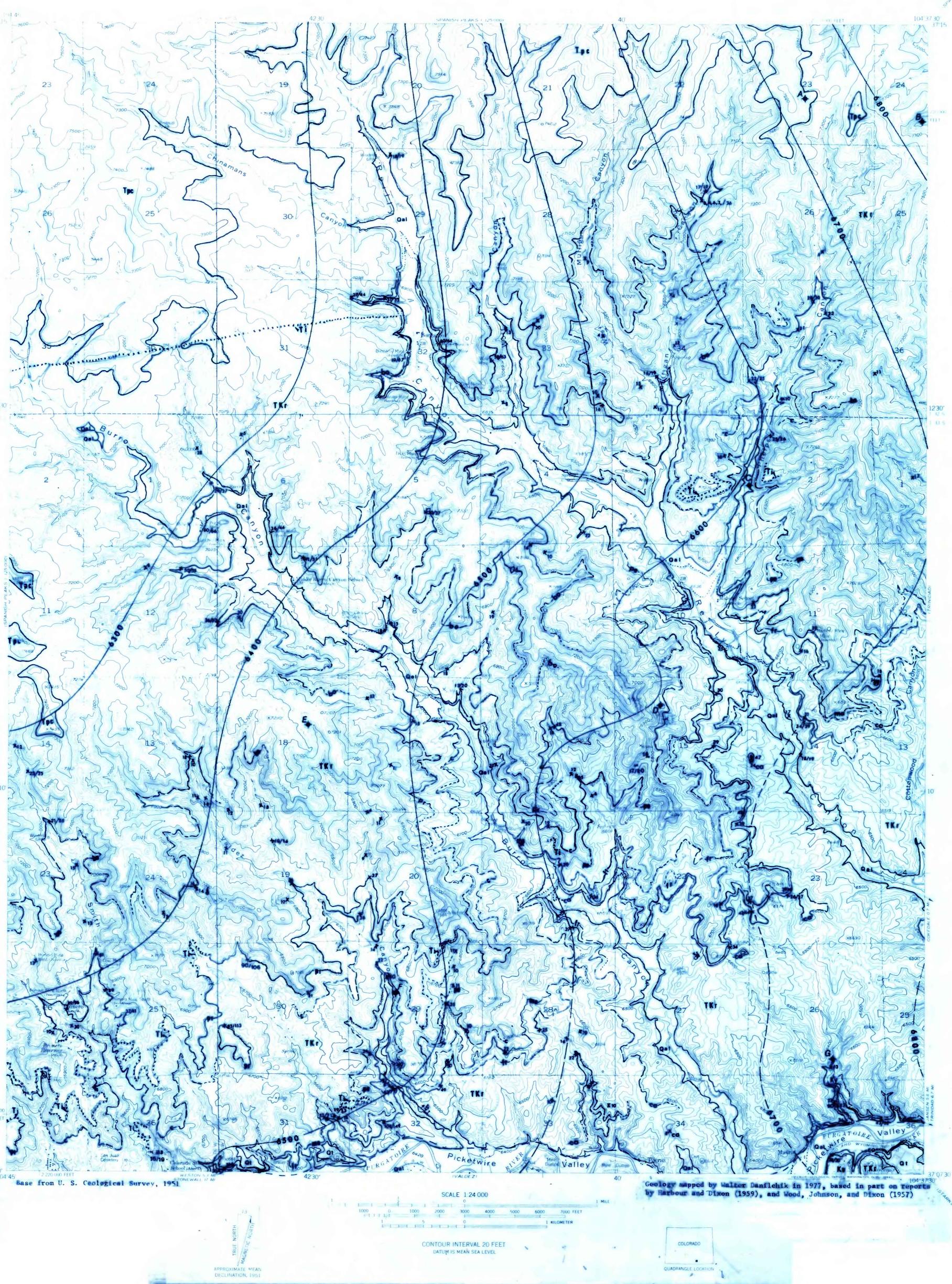
stone or conglomerate marks the top of the

many thin coaly shale and carbonaceous shale beds.

•1 foot = 0.3048 meter

coal bed

Cokeda1e

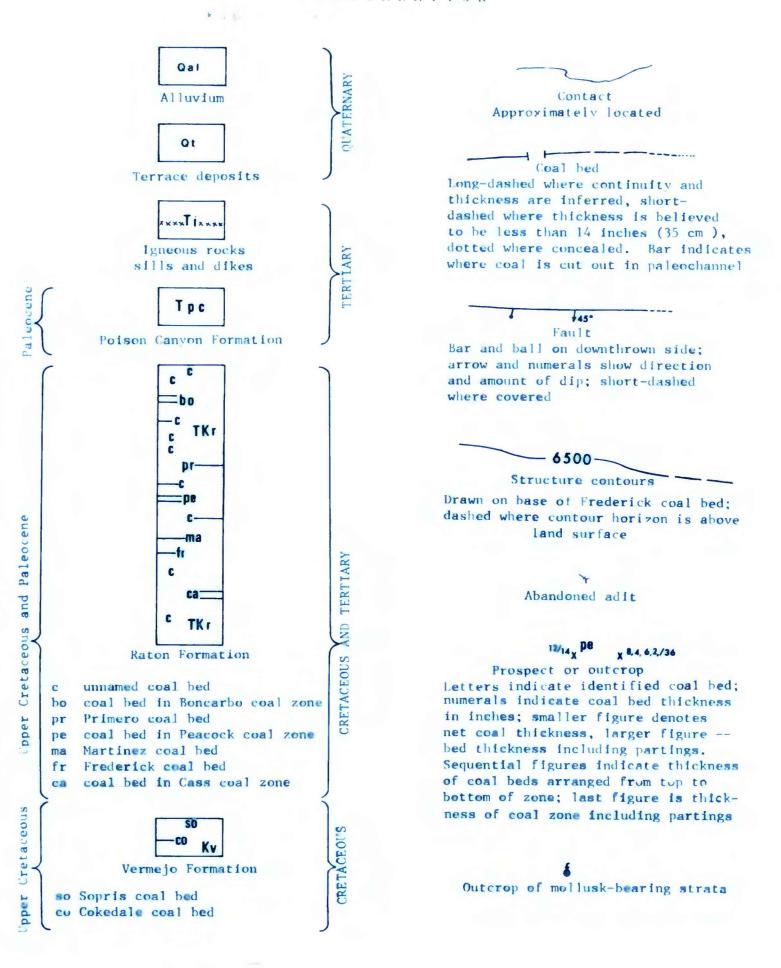


EOLOGIC AND COAL OUTCROP MAP OF THE MADRID QUADRANGLE, LAS ANIMAS, COLORADO

Valter Danilchi

OPEN-FILE REPORT 79-377 MADRID QUAD., COLORADO

EXPLANATION



Coal has been mined commercially from the Cokedale, Frederick, and Martinez coal beds, and most extensively, from beds of the Boncarbo coal zone. By 1947, when mining was shut down, production from the Boncarbo coal zone totalled 9.4 million short tons (Harbour and Dixon, 1959, p. 476), all of it by underground mining. No mines are presently being worked in the quadrangle.

ECONOMIC GEOLOGY

Published analyses of coal samples from this and nearby areas (Snyder, 1937) indicate that all of the coals in this area have the apparent rank of high volatile A bituminous, and are classed as low-sulfur coking coal with heating values that exceed 14,000 Btu/1b (calculated on a moist, mineral matter-free

In this area the minimum thickness of coal that is generally considered to be minable by underground mining methods is about 30 in. However, some beds as thin as 14 in could be mined by other methods including stripping or auger mining. Therefore the outcrop trace of all beds more than 14 in thick that are traceable for more than one mile were mapped.

Oil and gas test wells have been drilled into the Trinidad Sandstone in sec. 27 and 34 of T. 32 S., R. 65 W., at depths of 1,500 and 1,600 ft. No commercial quantity of ges was found. Small amounts of methane gas have been reported to have been found in some shallow coal exploration drill holes in the quadrangle.

Terrace deposits have locally been worked for gravel which is of good quality, consisting of cobbles and pebbles of metamorphic and crystalline rocks.

Ground water is reported to be adequate for domestic purposes in all parts of the quadrangle. Tube wells drilled into water-yielding sandstone beds of the Raton Formation at various elevations range from 50 to as much as 200 ft deep.

REFERENCES

Harbour, R. L., and Dixon, G. H., 1959, Coal resources of Trinidad-Aguilar area, Las Animas and Huerfano Counties, Colorado: U.S. Geol. Survey Bull. 1072-G, p. 445-489.

Snyder, N. H., 1937, Analyses of Colorado coals: U.S. Bureau of Mines Tech. Paper 574, 327 p.

Wood, G. H., Jr., Johnson, R. B., and Dixon, G. H., 1957, Geology and coal resources of the Starkville-Weston area, Las Animas County, Colorado: U.S. Geol. Survey Bull. 1051, 68 p.

DRILI HOLE DATA

| A | В | C | D | E |
|--|--------------------------|---|--|--------------------|
| Industry | Colorado Fuel & Iron Co. | U.S. Geological Survey | Industry | Industry |
| NF' SW Sec. 23, | Colorado Canyon NO. 3 | No. 78-3 | NE ¹ NW ¹ Sec. 15, | |
| T. 32 S., R. 65 W. | SE' SW Sec. 24 | NW^{1}_{ζ} SW^{1}_{ζ} Sec. 2, | T. 33 S., R. 65 W. | SW', NF', Sec. 18, |
| GL 7,450 (est) | T. 32 S., R. 65 W. | T. 33 S., R. 65 W. | GL 6,770 (est) | T. 33 S., R. 65 W. |
| | GL 7,172 | GL 6,735 (est) | R 164 | GL 7,150 (est) |
| R 221 | | | C 4 ma | B 30 |
| C 3 | R 45 | R 43 | R 32 | R 20 |
| R 83 | C 0.7 | C 0.5 fr | C 4 fr | C 6 |
| C 5 | R 55 | R 39 | R 36 | R 26 |
| R 32 | C 1.5 | C 1 | C 2 | C 7 |
| C 4 | R 114 | R 108 | R 18 | R 13 |
| R 42 | C 0.7 | C 1 | C 2 | C 3 |
| C 3 pr | R 23 | R 95 | R 146 | R 25 |
| R 168 | C 5 pe | C 1.5 | C 4 ca | C 2 |
| C 5 | R 71 | R 428 | R 32 | R 30 |
| R 30 | C 1.2 ma | C 1 | C 2 | C 5 bo |
| C 2 pe | R 32 | R 13 | R 109 | R 29 |
| R 4 | C 1.7 fr | C 3 | C 2 | C 2 |
| C 3 pe | R 122 | R 70 | R 30 | R 116 |
| R 11 | C 1.5 ca | C 1 | C 1 | C 3 |
| C 3 pe | R 32 | R 24 | R 18 | R 25 |
| R 169 | C 1.8 ca | c 1 | C 1 | C 2 |
| C 2 | R 91+ | R 73+ | R 125 | R 33 |
| R 5 | | | C 1 | C 5 pr |
| C 1 | | | R 7 | R 14 |
| R 1+ | | | C 0.5 | C 2 |
| | | | R 57 | R 208 |
| | | | C 1 | C 2 |
| | | | R 2 | R 59 |
| F | G | | C 1 | C 1 |
| Colorado Fuel & Iron Co. | Peabody Coal Co. | | R 61 | R 44 |
| Valdez Canyon No. 1 | No. 12 | | C 2 | C 3 ma |
| SE ¹ 4 NW ¹ 4 Sec. 29, | SW4 SE4 Sec. 26, | | R 26 | R 19 |
| T. 33 S., R. 65 W. | T. 33 S., R. 65 W. | | C 2 | C 2 fr |
| GL 6,614 (est) | GL 6,310 (est) | | R 48 | R 16 |
| | | | C 1 | C 2 |
| R 78 | R 29 | | R 18 | R 59 |
| C 1 | C 1 | | C 1 | C 4 ca |
| R 59 | R 11 | | R 17 | R 173 |
| C 3 fr | C 3 co | | C 1 | C 3 |
| R 5 | R 51 | | R 2 | R 199+ |
| C 1 | C 2 | | C 1 | |
| R 538 | R 26 | | R 2+ | |
| C 1 | C 3 | | K 21 | |
| R 41 | R 37 | EXPLANATION | | |
| C 1 | C 2 | P | | |
| R 36 | R 27 | ◆ B | | |
| C 2 | C 3 | | | |
| R 39 | R 14 | Coal exploratory drill hole | | |
| C 1 | C 3.5 | GL 7,172Collar elevation | | |
| R 42 | R 1+ | R 45Rock, in feet | | |
| C 1 | | C 0.7Coal, in feet | | |
| R 18 | | R 55 | | |
| C 1 | | C 5 peLetters identify | | |
| R 40+ | | coal bed. | | |
| | | | | |
| | | | | |
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This report has not been edited for conformity with U. S. Geological Survey editorial standards.